CSC165 fall 2019

average/summation/graphs

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Using Course notes: average analysis; graphs

average...

$$\mathcal{I}_{f,n} = \{i \mid i \text{ is an input to } f \wedge |i| = n\}$$

```
def has_even(number_list):
    for number in number_list:
        if number % 2 == 0:
            return True
    return False
```

average...

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average...

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    return False
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summation...

from notes...

$$\sum_{i=0}^{i=n-1} ir^i = \frac{nr^n}{r-1} + \frac{r - r^{n+1}}{(r-1)^2}$$

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finding a needle...

...when you know it's in the haystack

```
# num_list is a list of  numbers,
# a permutation of {1, 2, 3, ..., n}
def find_one(num_list):
    for i in range(len(num_list)):
        if num_list[i] == 1:
            return i
```

graphs (discrete ones)...

what can you do with them?

- represent friendships
- represent lecture sections
- represent tasks$\leftrightarrow$person

definitions...

$G = (V, E) \in \mathcal{G}$

degree, degree-sum, max number of edges?

paths, connectedness... in $G = (V, E)$

A path from u to v: Distinct vertices $v_0, \ldots, v_k$ in V where:

- $u = v_0$, $v = v_k$
- if $0 \leq i \leq k - 1$, then $(v_i, v_{i+1}) \in E$

We allow $k = 0$ — there is a path from v to itself

path length from u to v: number of edges in path from u to v

u, v are connected: There is a path from u to v.

graph G is connected: every pair $u, v \in G$ is connected

$$\forall n \in \mathbb{N}, \exists M \in \mathbb{N}, \forall G =$$
$$(V, E), (|V| = n \wedge |E| \geq M) \Rightarrow G \text{ is connected?}$$

Notes